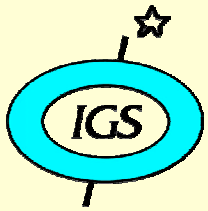
INDIGO: Inter-service Data Integration for Geodetic Operations

Quick Facts

Proposed November 2002

Selected July 2003

Funded July 2004



Supports the 3 Central Bureaus and CDDIS, and adds specific responsibilities to develop data and information services to support multi-technique studies.

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Some words from the proposal

"…providing uniform access to heterogeneous space geodetic data systems"

"…evolve data information systems well-suited to users' needs"

"…build upon the successful histories of each service to provide an ensemble information service whose utility to geodetic science is greater than the sum of its parts"

"…will allow a single point of entry to the combined set of IGS, ILRS, and IVS information, as well as a route to the technique-specific information systems"

Note: **INDIGO** plans to design extensibly, so other techniques' data can also participate.

Some words from the proposal

"*Each service will continue to maintain cognizance and management of its own information systems, to allow best application of domain expertise, as well as convenience to single-technique users. Areas common across the services will be re-engineered to meet agreed-upon characteristics*"

"The system will evolve to a unified web presence which draws from the technique-specific information systems. Data production will continued in the distributed manner… distribution will be augmented by geospatial search tools and GSAC capabilities which present data from the distributed sources as if from a single archive. User support will be strengthened with search capabilities, uniformity of presentation…"

First few goals & objectives

- Develop a common catalog of existing services and products
- Analyze interdependencies & identify synergies between current services (station metadata, signal source metadata, data & product information, publications, calendars, communication vehicles…)
- Develop & implement common interface for user access at each service where synergistic

First (real) milestone: Assess current services, prepare report on data and products.

In other words: Determine what the intertechnique investigators need, *then* decide on an implementation.

INDIGO User Needs Assessment

Goal: To ensure we direct our resources to designing data systems which are responsive to actual user needs in the development of multitechnique methods.

In other words: We will not begin detailed information system design until the requirements from the user community are understood.

We conducted interviews with 11 researchers from 10 institutions, and had other informal conversations at professional meetings in Fall 2004. For the interviews, we used a page of questions (both specific and open) to guide the discussion.

The Assessment

What kinds of data, metadata, and products do you need to gather and where do you typically get them? What kind of preparation do you have to do to use them? Have you have had to tediously put things together by hand? Is there some data type which you would like, but have not found, or have not found in a usable state?

Have you tried the GPS Seamless Archive Centers? Do you have a wishlist of capabilities regarding the provision of data, metadata, products, and/or information that would make your investigations easier?

What we learned

1. Development is hampered by difficulty in comparing and combining results from different groups.

Example: The IVS CONT02 campaign was not primarily designed for developing multitechnique analysis methods, but several groups took advantage of it for this purpose (because VLBI data was plentiful and co-located GPS data did not suffer equipment changes).

Groups had trouble deciding how to improve their analysis methods based on others' results, because there were too many ill-defined and/or ill-documented variables. Study and comparison of results is how progress is made!

If your analysis agrees better with ground truth than mine, is it because…

You know how to process VLBI and GPS data together better than I do?

You used a different source for the vectors (“local ties”) between the VLBI and GPS antennas than I did?

You used a different source for GPS antenna calibrations?

You used a different VLBI antenna deflection model?

What we learned

2. Plenty of additional metadata needs

- Site geology
- VLBI antenna dimensions & material
- Time-dependent mass of GPS satellites
- GPS satellite phase centers
- LEO shape, reflectivity, dynamic models
- Anomaly periods (e.g. snow, wet ground, equip probs)
- Met instrument calibration history

What we learned

3. **Need to get site tie info in machine-readable format** (minimally, tabular; optimally, SINEX). Offer all vectors (both observed and calculated).

4. **Acquiring co-location datasets to study**: search by period of data availability, geographical area, and/or data type ("Give me all co-located, simultaneous GPS and DORIS data from the southern hemisphere in Summer, 2003")

Actions to address user needs

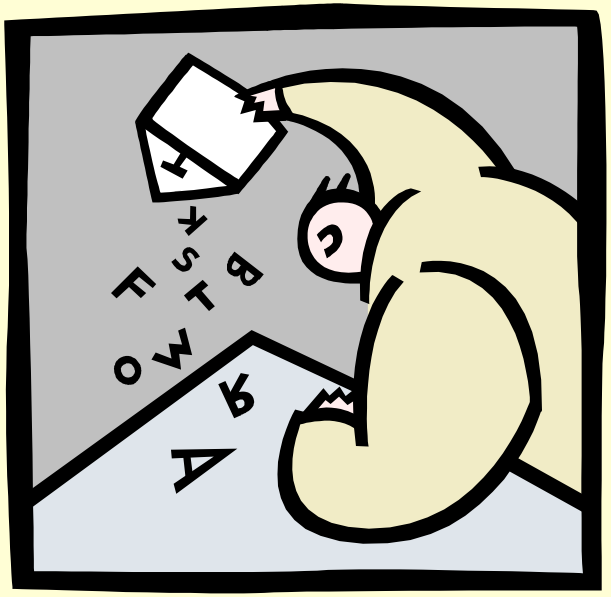
1. Arrange “campaigns” where investigators can study very well-defined multitechnique datasets available from a single location and compare results. Collect copious metadata about the analysis processes (software, models, etc.) used in forming the products and whom to contact for discussion.

INDIGO can certainly contribute indirectly by improving site metadata. The CDDIS archive could be a natural place to collect such material. **INDIGO** must coordinate with the IERS Combination Pilot Project.

Actions to address users' needs

2. Provide upgraded site and product information, including anomalous periods. Study the "alphabet soup" of metadata to select an appropriate design.

FGDC… ISO19115… OGC GML… SIO XML for Geodesy … DHF… PVL…



Actions to address users' needs

3. Coordinate with IERS WG2 on site co-location, and ITRS regarding providing site tie information.

4. Provide ability to discover suitable spatiotemporally coincident multitechnique data sets. Coordinate with GPS Seamless Archive Centers (GSAC) project regarding extending GSAC to other data and product types.

Global Seamless Archive Centers (GSAC)

"Without getting into the details the GSAC helps you locate GPS data files which are archived at different GPS Data Archive Centers from a single user interface."

(See http://gsac.ucsd.edu for the details!)

Various archives ("wholesalers") offer information about their holdings in machine-readable format. These are collected in a single database by a "retailer." A client queries a retailer for data sets constrained by, e.g., a spatial region and a timespan, and it is delivered from whatever wholesalers happen to have it.

User does not need to know access details at each archive!

What's behind GSAC

Archives make available standardized descriptions of their data holdings – what data type, location and time period corresponds to what file.

GPS observations and orbit products are currently supported. The model could be extended to other data and product types to allow selection across techniques.

Some principles responders mentioned

Respect the varying needs of experienced and new users.

Be inclusive with sites, including old (decommissioned) and regional sites.

Provide facilities not already provided elsewhere.

Be extensible to other techniques.

Adequately credit sources of information.

From here?

Begin to delve into system design to meet the community's stated needs.

Further input is welcome, particularly regarding how to remain extensible to other data types.